SATA-IO FAQ

What is SATA Express?
SATA Express™ is a section within the new SATA v3.2 specification which defines host and device connectors that support SATA or PCIe. SATA Express provides an ecosystem for client storage in which SATA and PCIe solutions can coexist. PCIe technology enables up to 1GB/s per lane, as compared to SATA at 0.6GB/s. SATA Express includes support for up to two PCIe lanes, or up to 2GB/s.

What is the recommended terminology for SATA Express?
- SATA Express specification: Defines host and device connectors that support SATA or PCIe
- SATA Express connectors: Host and device connectors defined in the SATA Express specification
- SATA Express host: System with a SATA Express host connector and the logic to switch between PCIe and SATA; a SATA Express host will mate and operate with a SATA Express PCIe drive or a SATA drive
- SATA Express PCIe device: A drive in an HDD-type form-factor (e.g. 2.5-inch) using a SATA Express connector; may support AHCI or NVMe

Why is there a need for a speed increase?
There is an emerging segment of the SATA market that requires higher performance than 6Gb/s. This segment includes client SSDs and hybrid storage devices, such as an HDD with an on-drive Flash cache. SATA 6Gb/s will be more than adequate for standard HDDs and other SATA devices for the foreseeable future.

Why didn't SATA-IO decide to just increase SATA to 12Gb/s?
The transition from 6Gb/s to 12Gb/s would not be simple, requiring significant changes to drive and host silicon, as well as the supporting infrastructure. On the other hand, PCIe is a mature technology with an existing infrastructure. PCIe 3.0 supports 8Gb/s (or 1GB/s) which provides an immediate speed increase over SATA at 6Gb/s (or 0.6GB/s), and PCIe can scale up in performance by simply adding lanes.

What does this mean for the long-term viability for SATA?
SATA is still the most widely implemented storage interface for desktop and mobile PC client systems, and we expect it to maintain this position for the foreseeable future. SATA-IO will continue to refine the specifications and interoperability programs to enable developers to produce highest quality storage solutions for their customers. We will also continue working to enhance SATA for use in additional device segments, where SATA 6Gb/s will prove advantageous. We fully expect to see the number of SATA implementations increase throughout all segments of the storage market.

When will the SATA Express specification be available?
The SATA Express specification has been available to SATA-IO members during its development and is now available to the public in SATA specification v3.2.

Why is it necessary to use all these different units for interface speed?
SATA and PCIe use different data encoding schemes which define the format of the data transmitted across the serial link. The encoding scheme affects the speed at which the actual data (minus the added encode bits) is transferred. So to fairly compare data transfer rates of interfaces with different encoding schemes, G**bits**/s must be translated to G**Bytes**/s**.** SATA utilizes 8b/10b encoding, which (without going into the math) means that 6Gb/s equates to 0.6GB/s. PCIe 3.0 uses 128b/130b encoding, which is more efficient than 8b/10b, so the PCIe 3.0 8Gb/s per lane translates to 1GB/s per lane. PCIe 2.0 (and 1.0) uses 8b/10b encoding, so the PCIe 2.0 5Gb/s per lane translates to 0.5GB/s per lane.

What is the M.2 card and what is the status of the specification?
M.2 (formerly known as NGFF) is a small form factor card – 22mm wide and from 30mm to 110mm in length. The M.2 specification, being developed by the PCI-SIG, covers all M.2 applications, including WiFi, WWAN, USB, PCIe and SATA, and is the normative ("official") mechanical and form factor specification for M.2 devices. An M.2 card with a SATA or PCIe interface will typically be an SSD, suitable for very thin devices such as Ultrathin notebooks or tablets. Detailed specifications will be contained in the PCI-SIG M.2 document; the SATA-IO specification only covers SATA M.2 connector pin layouts. The SATA-IO M.2 specification has been available to SATA-IO members and is now available to the public in SATA specification v3.2. M.2 developers need to be members of both organizations - SATA-IO, for SATA implementation information, and PCI-SIG, to get access to the complete M.2 specification.

What register interface / command set is recommended for client PCIe SSDs?
Although not defined by the specification, there are two choices for a client PCIe storage device register interface/command set:
1. AHCI, which is used for SATA, would enable a PCIe device to be compatible with SATA software environments
   - AHCI is supported in most major operating systems
   - But AHCI is not optimized for SSD performance
2. NVM Express is architected for high performance PCIe SSDs
   - But NVMe does not provide SATA software compatibility
   - Drivers for Windows, Linux, and other operating systems are available at www.nvmexpress.org

What else is new in SATA specification v3.2?
- microSSD: standardizes the pin layouts of single chip SATA SSDs for embedded storage applications

- USM Slim: The Universal Storage Module, announced in SATA specification v3.1, enables removable and expandable storage for consumer electronic devices. USM Slim reduces the thickness of the module from 14.5mm to 9mm

- DevSleep: SATA has long been an industry leader in minimizing power consumption. DevSleep provides another level of power management where the drive is almost completely shut down to meet the strict power requirements of Ultrathin notebooks, enabling such devices to be always on and always connected without unnecessarily reducing battery life.

- Transitional Energy Reporting: brings a new degree of sophistication to power management by recognizing that there is a cost in power when moving between power management modes. This feature provides the host with detailed information about the SATA storage device, allowing the host to make more informed decisions on minimizing power consumption

- SSHD Optimization: a Solid State Hybrid Drive (SSHD) is an HDD that contains some amount of Flash memory, thus increasing the performance of the drive. The Hybrid Information feature provides a mechanism wherein a host can tell the drive which data to cache, further enhancing the performance of the SSHD. In today's SATA drives, reading and writing log data required the use of non-queued commands, impacting overall system performance, especially SSHDs. A new feature in v3.2 allows such commands to be queued, minimizing the impact on performance

- Rebuild Assist: when a drive in a RAID configuration fails due to excessive data errors, it is possible to reconstruct the data from the failed drive from the remaining drives – this is called a Rebuild. The Rebuild Assist function speeds up the rebuild process by quickly recognizing which data on the failed drive is unreadable